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Environmental Hazards Assessment Program
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STANDARD OPERATING PROCEDURE

Procedure for Determining Wadable Stream Discharge With Price Current Meters

KEY WORDS-
Discharge, River, Stream

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Standard Operating Procedure is to define the approved method for estimating volume of flow (discharge) in a river using the Price Current and Pygmy Meters in conjunction with the CMD 9000 Digimeter Current Meter Digitizer.

2.0 MATERIALS

2.1 Current Meter- Model #1210 (AA) and Model #1205 (Pygmy) including for each:

- **2.1.1** cup assembly
- **2.1.2** tail fin assembly
- **2.1.3** carrying case
- **2.1.4** spare parts kit containing:
  - pivot assembly
  - binding post assembly
  - pivot set screw
  - thumb screw
  - hanger screw
- **2.1.5** rating charts
- **2.1.6** instrument oil
- **2.1.7** screwdriver

2.2 Top set wading rod (USGS Style) Model #1287
2.3 Tape measure or tagline (long enough to traverse the stream bed)
2.4 Stakes (to anchor tape to shore)
2.5 Mallet (to drive in stakes)
2.6 CMD 9000 Current Meter Digitizer
2.7 Data sheets (USGS Form 9-275-F, see attached) and clipboard
2.8 Waders

3.0 PROCEDURES

3.1 Determine the transect location. A site where the river is most consistent (in depth and flow rate) across its width is easier to sample and provides more accurate results. Measurements are best made along a straight reach of river (parallel to river flow). Avoid reaches with ox-bows, dry river beds,

piles of debris, tributaries and islands. If avoiding these areas is not possible, refer to Rantz 1983, Chapter 5, pages 179-180.

3.2 Pull the tape or tagline across the chosen transect keeping it perpendicular to the flow of water. Secure to stakes on either shoreline keeping the tape out of the water.

3.3 Measure the width of the river in feet and record on field data sheet. Try to estimate the total river discharge so the proper meter can be chosen, according to section **3.5**.

3.4 Assemble the current meter, wading rod and digitizer according to the instruction manual.

3.5 Digitizer needs to be set for the corresponding equipment being used.

3.5.1 Choose either the AA or the Pygmy meter by pressing the **Meter Type** key. If the depth is one foot or less the Pygmy meter should be used. If the depth is greater than one foot either meter may be used as long as the flow velocity does not exceed 3 feet per second. If the velocity is greater than 3 feet per second and less than 8 feet per second then the AA meter should be used. Minimum velocity for either meter is 0.8 ft/sec (.25 m/sec.)

3.5.2 Choose "single" head type, by pressing the **Head Type** key.

3.5.3 Choose English units by pressing the **Eng/Met** key.

3.5.4 Using the **Mode** key, choose Mode 1.

3.5.5 Use the **Review** key to confirm the proper parameters are set.

3.6 Once assembled, test the meter operation by performing a spin test. When assembled properly, spin the cup assembly briskly counterclockwise as viewed from above (NEVER SPIN THE CUP ASSEMBLY IN THE WRONG DIRECTION! This can damage the contact wires and cause inaccurate readings.) The cups should spin freely for a minimum of 60 seconds for the Pygmy meter and 3.5 minutes for the AA meter. Record results on the field data sheets. See section 3.14 if either meter fails spin test.

3.7 Left edge of water (LEW) should be identified as 0, right edge of water (REW) as the river width. LEW is the left edge of water when facing downstream. Determine the spacing of the measurement verticals for sampling. A rule of thumb is to use 25 to 30 increments. Use the smaller number of increments in transects that are consistent in depth and flow rate. Use a larger number of increments where the river is extremely wide. If large inconsistencies in flow rate or stream bed topography are found, then the number and size of sampling increments can be adjusted to accommodate the differences. If the flow adjacent to the shore is found to be extremely slow or absent, isolate the low flow area to its own increment.

3.8 Always sample the middle of all increments, whether they are equal or unequal in width across the transect chosen.

3.9 Place the wading rod with attached current meter at the first vertical. Hold it upright and measure the water depth.

3.10 Observation depth for current meter measurements is dependant on water depth. If the depth is less than 2.5 feet, then the one-point method should be used. In this method the current meter measurement is taken at a depth on the vertical that is equal to 60% of the total depth when measured from the surface of the water. This does not have to be calculated when using the USGS type top-set wading rod as it is calibrated to quickly set the 0.6 point by moving the sliding rod so that the foot measurement on it lines up with the tenth of a foot measure on the vernier. If the depth is greater than 2.5 feet than the two point method should be used. In this method two current meter measurements are taken at depths on the vertical that are equal to 20% and 80% of the total depth when measured from the water surface. This does not have to be calculated when using the USGS type top set wading rod. To set the 0.2 point, double the water depth measurement and then move the sliding rod so that the foot measurement on it lines up with the tenth of a foot measure on the vernier. To set the 0.8 point, halve the water depth measurement and then move the sliding rod so that the foot measurement on the sliding rod lines up with the tenth of a foot measure on the vernier.

3.11 Once the depth for the current meter measurement(s) has been established, press the **Start/Stop** key on the digitizer. The digitizer will initialize for a few moments and then begin reading revolutions and time elapsed simultaneously. After approximately forty seconds the digitizer will stop reading and display the final number of revolutions and the total elapsed time, followed by the discharge in cubic feet per second.

3.12 At each measurement vertical, record the following information on the field data sheet:

- **3.12.1** distance from the shore
- **3.12.2** depth of water
- **3.12.3** width of the increment
- **3.12.4** observation depth (0.6 for the one-point method or 0.2 and 0.8 for the two-point method)
- **3.12.5** revolutions of the current meter (at each depth)
- **3.12.6** time in seconds
- **3.12.7** discharge in cubic feet per second

3.13 To calculate total discharge, see reference text, Rantz, 1983, page 80.

3.14 Maintenance should be performed after each use and if the current meter fails the spin test.

3.14.1 Wash the current meter in DI water after each use and dry carefully.

3.14.2 Oil the points on the meter indicated in Figure 1 with the oil supplied with the meter. The points are: (1) Pentagear, (2) Shaft, (3) Bearing (which are all in the contact chamber) and the (4) Pivot bearing.

3.14.3 Always remove the Contact Chamber Cap and allow the internal parts to dry after each use.

3.14.4 After each use, turn the Knurled Raising Nut counterclockwise as far as it will travel to lock the Bucket Wheel in place.

3.14.5 If meters fail spin test after normal maintenance, refer to Instruction and Care Manual for Pivot Bearing Adjustment.

3.14.6 Factory service is recommended on a periodic basis.

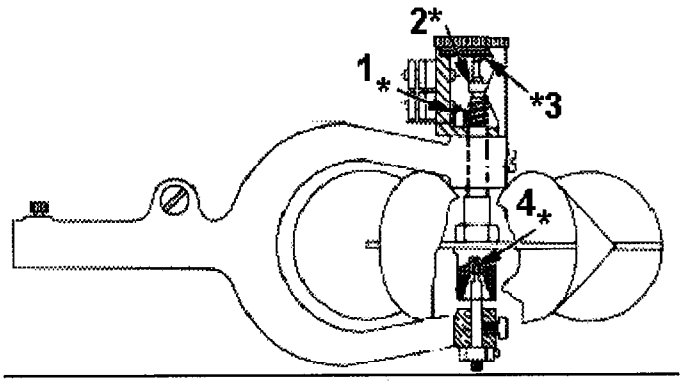

Figure 1

4.0 REFERENCES

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